

Patent
Serial No. 10/022,382
Amendment in Reply to Office Action of January 9, 2006

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended): A method of processing analog color signals, the method comprising:

analog preprocessing ~~(2, 3)~~ sensor output signals to obtain analog preprocessed signals that cause a reduced amount of digital quantization errors;

converting ~~(5)~~ the analog preprocessed signals into digital signals;

reconstructing ~~(7)~~ a first basic color signal ~~(R)~~ R, a second basic color signal ~~(G)~~ G, and a third basic color signal ~~(B)~~ B from the digital signals; and

correcting ~~(9)~~ the basic color signals to obtain standardized signals, the correcting step comprising multiplication of a three color signal matrix containing the first, second and third basic color signals ~~(R, G, B)~~ R, G, B by a correction matrix containing RGB matrix coefficients that depend on the analog preprocessing step ~~(2, 3)~~.

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Claim 2 (original): A method according to claim 1, wherein the analog preprocessing step includes a white balance adjustment.

Claim 3 (original): A method according to claim 2, wherein the coefficients of the correction matrix depend on the analog preprocessing step in that correction matrix coefficients a_{xy} are replaced by coefficients b_{xy} with

$$\begin{aligned}b_{11} &= a_{11} \\b_{12} &= a_{12} \times awbR \\b_{13} &= a_{13} \\b_{21} &= a_{21} / awbR \\b_{22} &= a_{22} \\b_{23} &= a_{23} / awbB \\b_{31} &= a_{31} \\b_{32} &= a_{32} \times awbB \\b_{33} &= a_{33}\end{aligned}$$

wherein awbR equals a total contribution of Red divided by a total contribution of Green and awbB equals a total contribution of Blue divided by a total contribution of Green wherein the total contributions of Red, Green and Blue are determined from the standardized signals.

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Claim 4 (original): A method according to claim 1, wherein the sensor output signals comprise first, second and third analog color signals R_a , G_a and B_a , and wherein said analog preprocessing step includes respectively multiplying the color signals by

 cR cG cB

where $cR = \sum R$ if $\sum R > 1$, else $cR = 1$;

where $cG = \sum G$ if $\sum G > 1$ else $cG = 1$;

where $cB = \sum B$ if $\sum B > 1$ else $cB = 1$, with

$$\sum R = a_{11} + a_{12} + a_{13}$$

$$\sum G = a_{21} + a_{22} + a_{23}$$

$$\sum B = a_{31} + a_{32} + a_{33}$$

with a_{xy} being the coefficients the correction matrix would have without the analog preprocessing step, and wherein the coefficients a_{xy} of the correction matrix are replaced by coefficients b_{xy} with

$$b_{xy} = a_{xy} / cR \text{ for } x = 1, 2, 3 \text{ and } y = 1;$$

$$b_{xy} = a_{xy} / cG \text{ for } x = 1, 2, 3 \text{ and } y = 2;$$

$$b_{xy} = a_{xy} / cB \text{ for } x = 1, 2, 3 \text{ and } y = 3.$$

Claim 5 (currently amended): A device for processing analog

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color signals, the device comprising:

means for analog preprocessing ~~(2, 3)~~ sensor output signals to obtain analog preprocessed signals that cause a reduced amount of digital quantization errors;

means for converting ~~(5)~~ the analog preprocessed signals into digital signals;

means for reconstructing ~~(7)~~ a first basic color signal ~~(R)~~ R, a second basic color signal ~~(G)~~ G, and a third basic color signal ~~(B)~~ B from the digital signals; and

means for correcting ~~(9)~~ the basic color signals to obtain standardized signals, the correcting means comprising means for multiplying a three color signal matrix containing the first, second and third basic color signals ~~(R, G, B)~~ R, G, B by a correction matrix containing *RGB* matrix coefficients that depend on the analog preprocessing means ~~(2, 3)~~.

Claim 6 (currently amended): A device according to claim 5, wherein the analog preprocessing means ~~(3)~~ includes means ~~(3)~~ for carrying out a white balance adjustment.

Claim 7 (original): A method according to claim 6, wherein the

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coefficients of the correction matrix depend on the analog preprocessing step in that correction matrix coefficients a_{xy} are replaced by coefficients b_{xy} with

$$\begin{aligned} b_{11} &= a_{11} \\ b_{12} &= a_{12} \times awbR \\ b_{13} &= a_{13} \\ b_{21} &= a_{21} / awbR \\ b_{22} &= a_{22} \\ b_{23} &= a_{23} / awbB \\ b_{31} &= a_{31} \\ b_{32} &= a_{32} \times awbB \\ b_{33} &= a_{33} \end{aligned} \tag{6}$$

wherein awbR equals a total contribution of Red divided by a total contribution of Green and awbB equals a total contribution of Blue divided by a total contribution of Green wherein the total contributions of Red, Green and Blue are determined from the standardized signals.

Claim 8 (currently amended): A device according to claim 5, wherein the sensor output signals comprise first, second and third analog color signals R_s , G_s and B_s , and wherein said analog preprocessing means ~~(2)~~ includes means ~~(2)~~ for respectively multiplying the color signals by

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cR

cG

cB

where $cR = \sum R$ if $\sum R > 1$, else $cR = 1$;

where $cG = \sum G$ if $\sum G > 1$ else $cG = 1$;

where $cB = \sum B$ if $\sum B > 1$ else $cB = 1$, with

$$\sum R = a_{11} + a_{12} + a_{13}$$

$$\sum G = a_{21} + a_{22} + a_{23}$$

$$\sum B = a_{31} + a_{32} + a_{33}$$

with a_{xy} being the coefficients the correction matrix would have without the analog preprocessing step, and wherein the coefficients a_{xy} of the correction matrix are replaced by coefficients b_{xy} with

$$b_{xy} = a_{xy} / cR \text{ for } x = 1, 2, 3 \text{ and } y = 1;$$

$$b_{xy} = a_{xy} / cG \text{ for } x = 1, 2, 3 \text{ and } y = 2;$$

$$b_{xy} = a_{xy} / cB \text{ for } x = 1, 2, 3 \text{ and } y = 3.$$

Claim 9 (original): A color camera comprising:

a sensor for generating sensor output signals; and

a device as claimed in claim 5.